

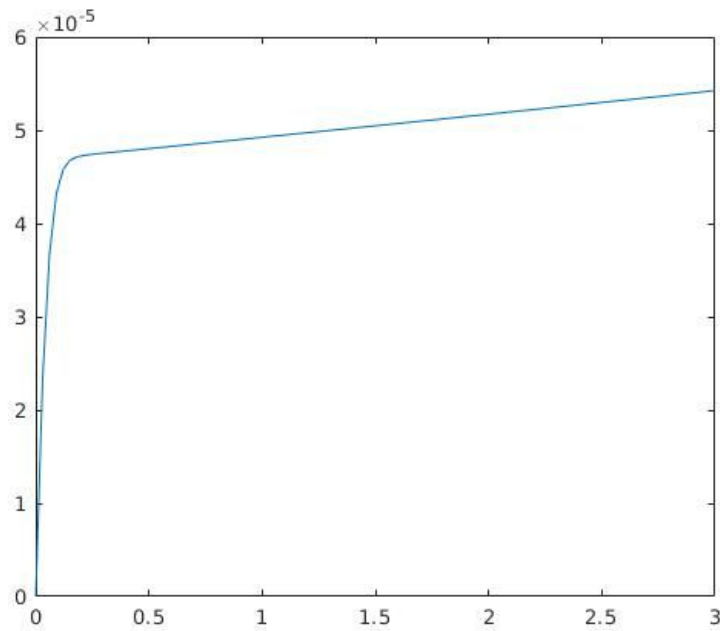
EE 620: Physics of Transistors

Assignment 3: Report

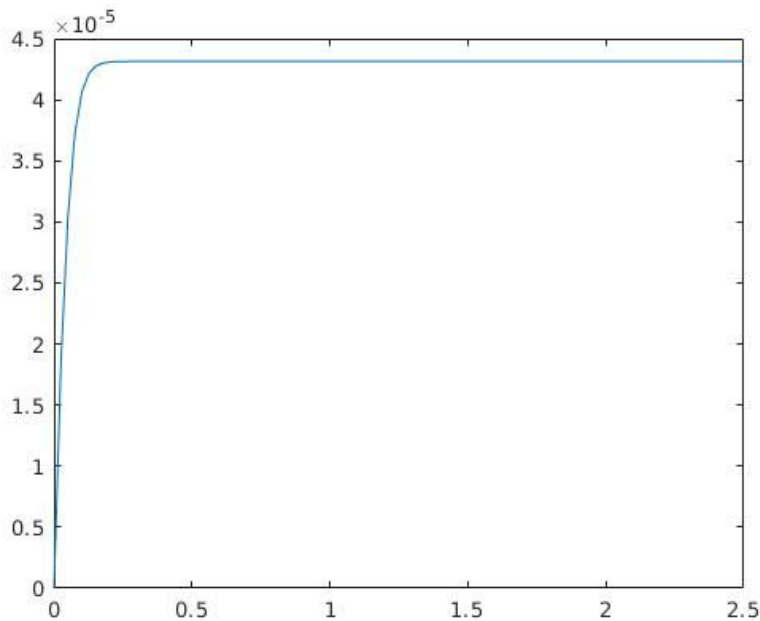
Dimple Kochar- 16D070010

1. Pao Sah model: q1ps.m, Brews model: q1b.m

(Note the integral in pao-sah has been done using Reimann sum, so, it takes a long time to run)



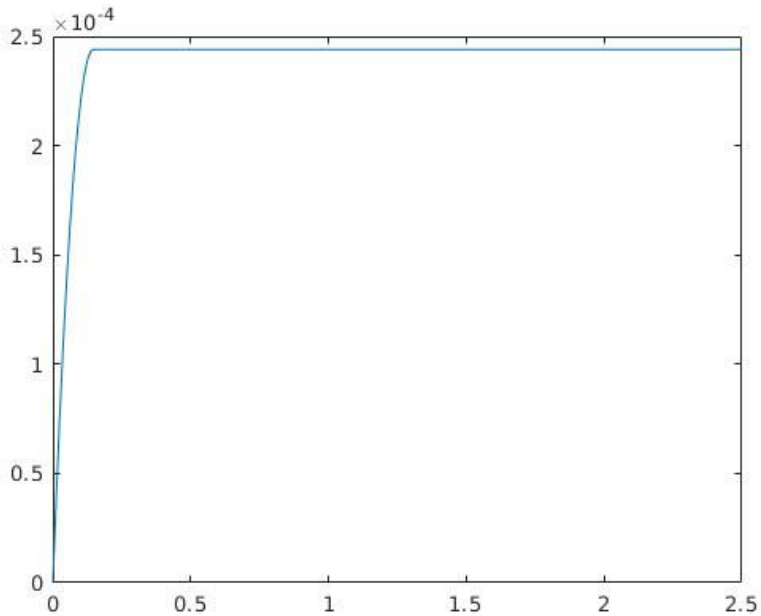
ID vs VDS @ VGS=VTH for Pao Sah



ID vs VDS @ VGS=VTH for Brews

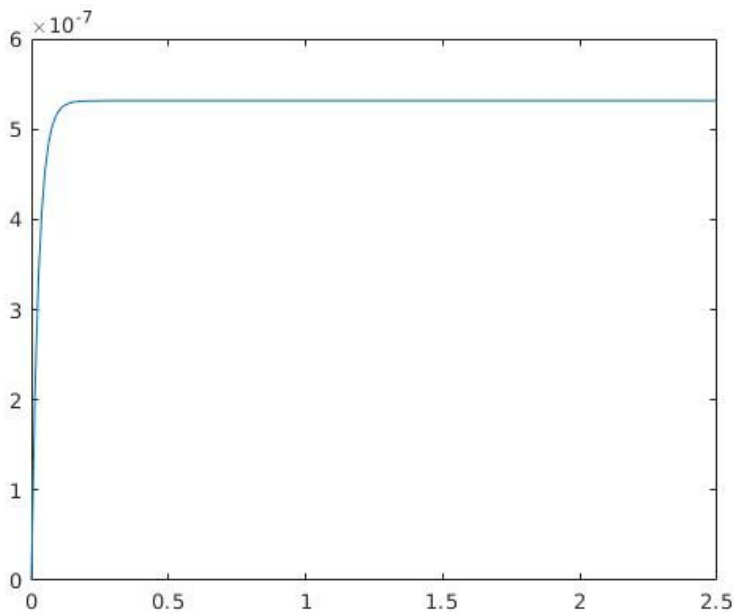
2. Since for piecewise we have two different expressions for ID, one conditioned on $V_G > V_T$ and other on $V_G < V_T$, the given $V_G = V_T$ in the question there is no expression. This is because piecewise is valid for V_G significantly less or more than V_T . For V_G close to V_T we fudge and join the V_G vs I_{DS} curve. Therefore, we get mismatched results as compared to Pao-Sah and Brews models.

Considering $V_G > V_T$ piecewise expression: q2pc1.m



ID vs VDS @ VGS=VTH for Piecewise expression for $V_G > V_T$

Considering $V_G < V_T$ piecewise expression: q2pc.m

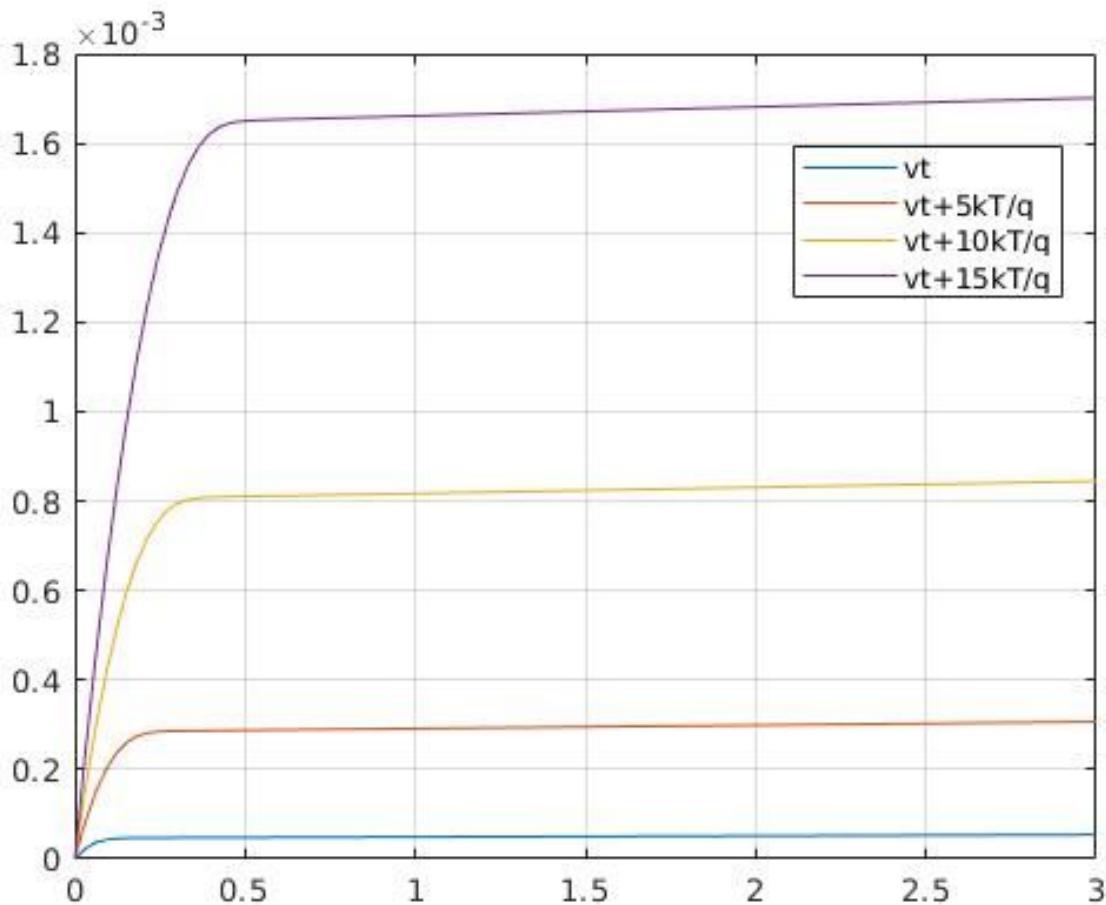


ID vs VDS @ VGS=VTH for Piecewise expression for $V_G < V_T$

We can see that the saturation current value for pao-sah and brews model is between that of piecewise $V_G > V_T$ and $V_G < V_T$.

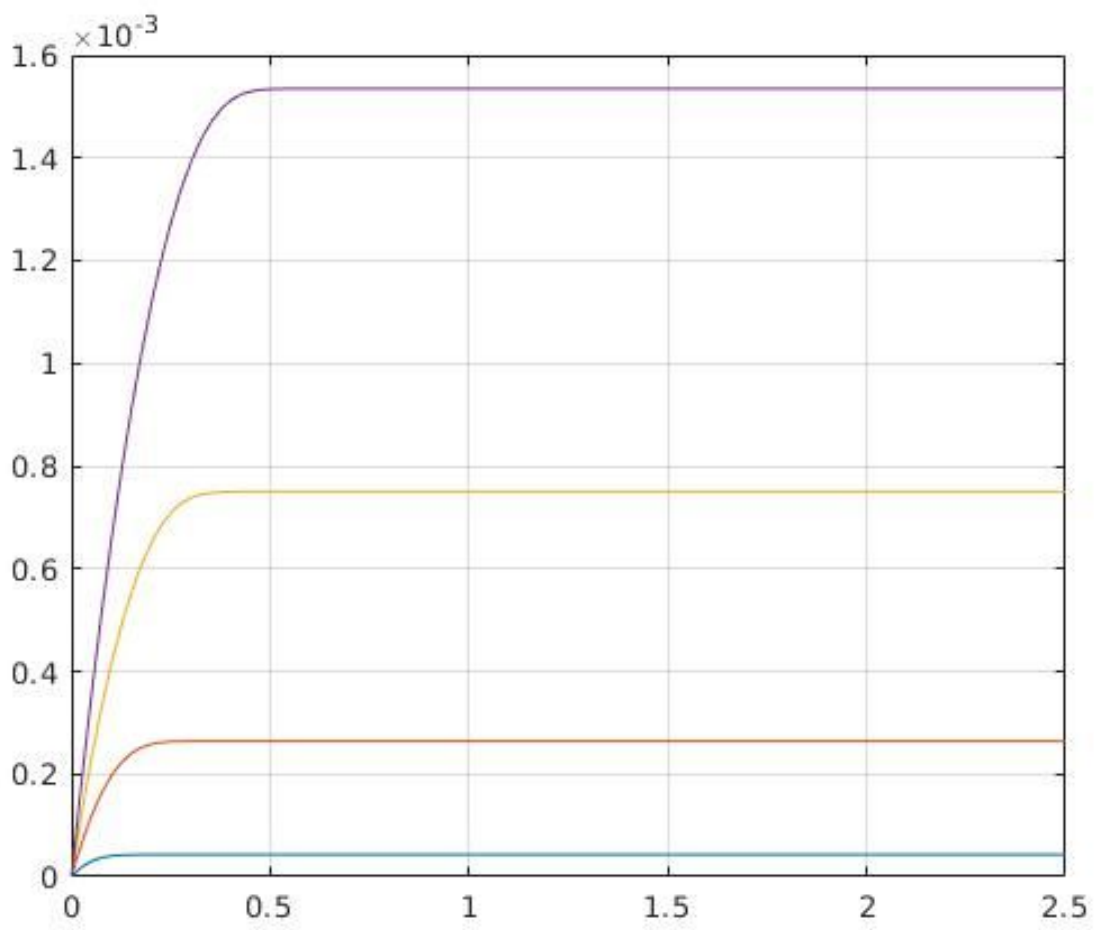
3. Pao Sah model: q3ps.m, Brews model: q3b.m

(Note the integral in pao-sah has been done using Reimann sum, so, it takes a long time to run)



ID vs VDS @ VGS shown in legend for Pao Sah

Note here, the current has a slight slope, i.e., even after reaching saturation it continues to increase slightly, unlike in Brews. So, the current levels are slightly higher than Brews. For higher V_{GS} values, this difference is more apparent. Therefore, as V_g increases mismatch increases. Also, Brews shows a constant saturation current, whereas in Pao Sah, the current slightly increases with a small slope as V_{DS} increases.



ID vs VDS @ VGS shown in legend for Brews